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ABSTRACT

A series of four experiments explored a discrepancy in the findings of research regarding the use of the keyword method for learning vocabulary, specifically whether the presentation method (paced vs. unpaced) or the treatment administration (subjects in groups vs. subjects as individuals) determines its effectiveness. Two experiments involved individual college undergraduates whose task was to learn Spanish vocabulary items, while the other two experiments involved small groups of high school students who were to learn lists of low-frequency English nouns. In each of the four experiments, there were two experimenter-paced groups--one instructed to use the keyword method and the other provided with no specific strategy--and two subject-paced groups, also using either the keyword or no specific strategy. The results of these experiments are as follows: (1) under the subjects-as-individuals condition, reliable keyword effects were detected for both paced and unpaced subjects; and (2) under the subjects-in-groups condition, the recall of keyword users was reliably lower than that of the control subjects regardless of presentation method. These results suggest that it is the method-of-treatment administration (individual vs. group) rather than the method-of-item presentation (paced vs. unpaced) that is the reason for the failure of previous research to obtain positive keyword effects. They also suggest a need for investigators to redirect their efforts from studying pacing-interaction limitations to finding a solution to the group-administration difficulties apparent in the earlier research. (LLZ)

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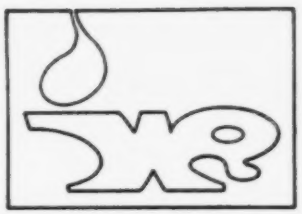

Working Paper No. 329

Re-examining the `Limitations´ of the Mnemonic Keyword Method

by Michael Pressley, Joel R. Levin, Nancy Digdon, Susan L. Bryant, Julia E. McGivern, and Kathryn Ray

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Running Head: "Limitations" of the Keyword Method

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Abstract

Hall, Wilson, and Patterson (Journal of Educational Psychology, 1981, 73, 345-357) concluded that with sophisticated students, the usefulness of the mnemonic keyword method is limited to occasions when presentation of the items is paced by an external agent. The four experiments reported here each varied whether subjects studied a vocabulary list using the keyword method or their own strategies, and whether items were experimenter- or subject-paced during presentation. Contrary to the position of Hall et al., no pacing-by-treatment interaction materialized in any of the experiments. As in previous keyword research with late adolescents, positive keyword effects were produced when subjects were instructed individually, but not when they were instructed in groups.

Re-examining the "Limitations" of the Mnemonic Keyword Method

The keyword method (Atkinson, 1975) is a two-stage mnemonic procedure for learning the meanings of first- and second-language vocabulary items. The most common version of the technique is based on the construction of interactive visual images. That is, the learner generates an image in which the definition referent of the to-be-learned vocabulary word is related to a "keyword" (a word that sounds like a salient part of the vocabulary item). Consider, for example, the Spanish word carta meaning (postal) letter. Using the keyword cart, a learner might generate an image of a shopping cart transporting a letter. There is a considerable body of literature documenting the efficacy of the keyword method for vocabulary learning (see Pressley, Levin, & Delaney, 1982). Nonetheless, Hall, Wilson, and Patterson (1981) recently reported a series of four experiments in which positive keyword effects generally were not obtained--leading the authors to conclude that the keyword method has important limitations. The purpose of the present study was to assess the status of these "limitations."

The subjects in the Hall et al. (1981) experiments were college students enrolled in either introductory psychology or educational psychology classes. In each of their experiments, groups of subjects who were taught the keyword method were compared with groups of no-strategy control subjects on a Spanish vocabulary-learning task. In Experiments 1-3, subjects were presented the

list of vocabulary items for a fixed period of time, and were permitted to pace their study of the items themselves. The most important result for the present discussion is that no recall advantage for the keyword method was obtained in any of the first three experiments of Hall et al.

Hall et al. (1981) hypothesized that the critical difference between their experiments (which failed to produce positive keyword-method effects) and previous research (which did) was the manner in which the items were presented for study. In particular, Hall et al. noted that in the initial studies testing the method (e.g., Raugh & Atkinson, 1975), the presentation of the vocabulary items was paced by the experimenter, in contrast to the subject-paced procedure that they adopted. In order to test this hypothesis, Hall et al. (1981, Experiment 4) varied the method of presenting the vocabulary words (paced versus free study) and instructional strategy (keyword versus no-strategy control). As predicted, there was an interaction of presentation method and instructional strategy such that control recall was superior to keyword recall with free study, but keyword recall exceeded control recall with paced study. Hall et al. (1981) concluded that keyword-method effects with "expert learners such as university students" are restricted to occasions when the subjects are required to perform under less than optimal "conditions"--such as when a paced method of item presentation is used. Under such conditions, the argument goes, control subjects are unable to deploy spontaneously-generated effective strategies to their fullest (Hall et al., 1981, pp. 356-357).

There are, however, several aspects of the Hall et al. study (as well as data from previous studies) that prompted us to take issue with this conclusion. Of the greatest significance was the previous evaluation of the presentation method hypothesis by Levin, Pressley, McCormick, Miller and Shriberg (1979). In the Levin et al. Experiment 3, high school students were tested individually and were given either keyword or control instructions. Presentation of items was either paced or unpaced. Although items were learned better with free study than with pacing, the keyword method produced superior learning regardless of the method of presentation, and there was no hint of the interaction reported in Experiment 4 of Hall et al. (1981). Hall et al. suggest that the discrepant results are due to age-related subject population differences (i.e., high schoolers in the case of Levin et al. versus college students in the case of Hall et al.), and that the pattern is consistent with their version of the presentation method hypothesis mentioned earlier. That is, college students, being more "expert learners" than high school students, would more likely be spontaneously strategic when allowed a free method of study. For a variety of reasons, the Hall et al. account of the discrepancy related to the paced vs. free study issue did not appear satisfactory. Consequently, the issue was re-examined here in four experiments.

Given that the "presentation method" flag raised by Hall et al. (1981, Experiment 4) is suspect--and constitutes the main topic of the present investigation--what else might have accounted for the lack of positive keyword effects obtained by

those authors? Based on our own research, the most plausible candidate is the nature of treatment administration, namely, whether subjects are treated in groups or on an individual basis. Hall et al. treated and tested their subjects in groups. Levin et al. (1979) discovered in a series of experiments that the keyword method cannot be easily implemented with groups of adolescents, even though both individual keyword-method administrations with adolescents and either group or individual keyword-method administrations with children are successful (see also Pressley et al., 1982). The solution to this puzzle is still undetermined and currently under investigation by the present authors. Important for present purposes is that the decision of Hall et al. to employ group-administered treatments quite possibly contributed to their failure to find positive keyword-method effects. Additional data bearing on this issue are reported here in two new experiments.

In summary, the present study was motivated by two areas of contention associated with the study and conclusions of Hall et al. (1981). Primary emphasis is on the "presentation method" issue, with secondary emphasis on the "treatment administration" issue.

Experiments 1a and 1b

The results of the Hall et al. (1981) second experiment were probably the most damaging to the keyword position, assuming that the results were due to the factors cited by those authors. In their Experiment 2, the items were extremely similar to items

used in our previous experiments which have produced positive keyword effects with college students (e.g., Pressley, Levin, Nakamura, Hope, Bispo, & Toye, 1980). Each item (Spanish nouns) had an imageable definition and a keyword that was acoustically identical to the first syllable of the word. The similarity of materials used in Experiment 2 of Hall et al. and those used in our previous research was the principal reason for our selecting the materials from that experiment to re-examine the Hall et al. conclusions.[1]

The main purpose of Experiment 1 was to attempt to replicate the Hall et al. (1981, Experiment 4) interaction between method of pacing and instructional strategy with college students who are treated individually (rather than in groups). Although Experiment 1 was not an exact replication of any of the Hall et al. experiments, it included the main components of all of their experiments. We used keyword and control instructions from our previous experiments, which appeared to be similar to the instructions used by Hall et al. Because three of the four experiments of Hall et al. involved one study trial, we also included one study trial. A 10 second per item study rate (four minutes for the list of 24 items) was selected because pilot testing established that with this rate both ceiling and floor effects in the various conditions would be avoided. Finally, Experiment 2 of Hall et al. included a "familiarization" period, during which keyword subjects were given the vocabulary/keyword pairings for study (keyword learning) while control subjects were allowed to study the vocabulary/definition pairings (extra exposure). We varied whether subjects received

familiarization (Experiment 1a) or not (Experiment 1b), in order to determine whether that variable was a moderator of the effects obtained.

Method

Subjects. Eighty undergraduates enrolled in an introductory psychology course at the University of Western Ontario participated in these experiments. Forty subjects were randomly assigned in equal numbers to the four conditions of Experiment 1a, and 40 to the four conditions of Experiment 1b.

Materials. The Spanish vocabulary items (and their keywords) used by Hall et al. (1981, Experiment 2) formed the 24-word list employed here.[2] Subjects in the keyword conditions were presented the vocabulary words, along with their meanings and keywords. Control subjects were presented only the vocabulary items and their meanings. The Spanish word lapiz (pencil) and doronico (leopard) were supplied as examples during the instructions given to subjects.

In the paced conditions, the items were typed in capital letters on 5" x 8" (12.7 x 20.3 cm) cards. Unpaced subjects were presented the items typed in capital letters and double spaced on an 8 1/2" x 11" (21.6 x 27.9 cm) piece of paper. In all conditions, the items were presented in the order shown in Table 1 of Hall et al. (1981).

The keyword subjects of Experiment 1a were also shown the words and their keywords during one minute of exposure before the presentation of the vocabulary items for the four-minute study period. In the paced keyword condition, these items were presented

individually typed on 5" x 8" (12.7 x 20.3 cm) cards. In the unpaced keyword condition, the words and keywords were typed on a single sheet in the same order that the items appeared on the actual study sheet.

Design and procedure. The two experiments were conducted concurrently. Each subject was tested individually by a female graduate student in a small room in the psychology department at the University of Western Ontario. Half of the subjects were instructed to use the keyword method to learn the vocabulary words, and half were given no-strategy control instructions. These instructions were administered using the sample items for illustrative purposes. Keyword subjects were told to notice that the first part of the vocabulary word sounded like the keyword, which was provided to them. They were instructed to construct interactive images involving the keywords and English meanings. Control subjects were told to try hard to remember the meanings of each vocabulary word.

In Experiment 1a, subjects were given one minute of familiarization with the items after the initial instructions. During this familiarization period, control subjects were instructed to use the time to learn the words and their meanings. In the paced condition, subjects were shown each card containing a word for 2-1/2 seconds per word; whereas in the unpaced control condition, subjects were shown the page containing the words and their meanings for the familiarization minute. In the two keyword conditions, subjects were presented the words and their keywords

for one minute, with an instruction to learn the keyword for each item. The items were presented on cards for 2-1/2 seconds apiece in the paced keyword condition, and on a typed sheet containing the words and keywords in the unpaced keyword condition. Immediately after the minute of familiarization, subjects were presented the 24 words for the four-minute study trial. In Experiment 1b, subjects were presented the four-minute learning trial immediately after the directions were presented.

In each experiment, the manner of presentation of the items varied between paced and unpaced conditions. Subjects in the paced conditions were shown each word on a card for 10 seconds at a time. In the unpaced conditions, the subjects were provided a page with all items printed on it, and were given four minutes (an average of 10 seconds per item) to study the words. Before the study period, subjects in all conditions were told the amount of study time that would be available to them. All subjects were told that a test requiring cued recall of the meanings would be given immediately after presentation of the vocabulary items. As detailed in the Materials section below, keyword subjects were presented the vocabulary words, keywords, and meanings, whereas control subjects were provided only the vocabulary words and their meanings.

Immediately after the presentation of the words for study, subjects were tested for their memory of the English meanings. All subjects were provided the Spanish words typed in the same random order, different from the order of presentation during study. The subjects were instructed to write the meaning of each

word in the space after the word. They were permitted to work on the test until they indicated that they could remember no more items.

After finishing the test, subjects in the keyword conditions were asked to do two additional things. First, they were presented a blank sheet identical to the test sheet and were instructed to write the keyword (the "sound-alike" word) for each of the vocabulary words. They were given as much time as they needed to complete this exercise. Then, keyword subjects were asked questions designed to assess how faithful they were to the instructions. Specifically, they were asked, "Did you get a picture in your head of the sound-alike word doing something with the word's meaning for every word, or only some of them? If not all, out of 24, for how many did you get a picture of the sound-alike word doing something with the meaning?" Subjects who indicated that they did not use the keyword method for all of the items were presented a duplicate of the study page and were asked to check each item for which they did use the method.

After the test on meanings, control subjects were quizzed on whether they had spontaneously adopted the keyword strategy during the learning of vocabulary items. They were asked to respond to the following paragraph:

> Sometimes people use a strategy to learn vocabulary words. I'm interested in one particular strategy. Did you ever do anything like the following to learn the vocabulary words? For instance, part of <u>lapiz</u> sounds like the word lap and <u>lapiz</u> means pencil. You might have imagined in your head a pencil in a lap. Or consider the word <u>doronico</u> which means leopard.

> Part of doronico sounds like the word door. You might have made a picture of a door and a leopard doing something together, maybe a leopard standing in a door. Did you ever do anything like that where you took part of what the word sounded like and put it in a picture with what the word meant? If yes, out of 24 words, how many did you do it for?

Control subjects were then asked, "Did you ever take the sound-alike word and put it in a sentence with the meaning, like 'The leopard stood in the door.'? If yes, out of 24 words, how many did you do it for?" Subjects who indicated that they did use the keyword method to learn at least some items were given a duplicate of the study sheet and were asked to put a check beside each word that they learned using the keyword method.

Results and Discussion

Mean percent recall, by condition, is reported in Table 1 for each experiment. In each case, the data were analyzed according

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Insert Table 1 about here

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to a 2 (instructional strategy: keyword vs. control) by 2 (method of presentation: paced vs. unpaced) analysis of variance. Based on 36 degrees of freedom, the mean square error was 631.51 in Experiment 1a and 302.47 in Experiment 1b. All sources of variance were tested using a Type I error probability of .05.

In both experiments, keyword subjects recalled significantly more English meanings than did control subjects. In Experiment 1a, the mean recall for keyword and control subjects was 66.4% and

46.2%, respectively, $F(1,36) = 6.47$, $p < .025$; and in Experiment 1b, the means were 65.8% and 47.9%, $F(1,36) = 10.61$, $p < .01$. In Experiment 1b, subjects who were not paced through the list of items recalled significantly more than those who were, 68.3% vs. 45.4% correct, $F(1,36) = 17.36$, $p < .001$. Though in the same direction, the effect was not significant in Experiment 1a, 61.9% vs. 50.8% correct, $F(1,36) = 1.39$, $p > .20$. Important evidence against the Hall et al. (1981) "presentation method" hypothesis was the complete lack of an interaction in either experiment, both Fs < 1. That is, in both experiments, keyword subjects outperformed control subjects by a comparable amount in the unpaced and the paced conditions.

Among subjects in the control conditions in the two experiments, 17 out of 40 (42.5%) reported having spontaneously used the keyword method for at least some items. These keyword-using control subjects reported having used the method for a mean of 42% of the items. The average correlation in the four control conditions between the number of keyword-elaborated items and meaning recall (based on Fisher-transformed correlations) was .41 ($p < .05$). Across all control subjects, the probability of recalling the meanings of keyword-elaborated items was .81, and that for the other items was .45.

Each keyword subject in the two experiments reported having used the keyword method for at least seven items (29%), with a mean of 78%. The average correlation between the number of items reported as having been studied using the keyword method and

recall of their meanings was .76 ($p < .001$). The probability of recall for items reported as having been keyword elaborated was .80, whereas that for the other items was .16. The mean percent of keywords recalled by keyword subjects was 83%, and the average correlation between keyword recall and meaning recall was .60 ($p < .001$).

It is possible that subjects in the unpaced conditions did not study all items. Thus, conditional probabilities were calculated just for paced subjects in order to provide data based on items known to have been studied. Across the two experiments, the probabilities of recall of items reported as having been keyword elaborated were .73 and .74 in the paced control and paced keyword conditions, respectively. The corresponding probabilities for recall of items not reported as having been elaborated were .08 and .12.

Thus, in contrast to the results of Hall et al. (1981), but consistent with the preponderance of keyword research (see Paivio & Desrochers, 1981; and Pressley et al., 1982), reliable keyword effects were detected in both experiments regardless of whether the presentation of the items was experimenter-paced or subject-paced. Consequently, the Hall et al. inclination to dismiss the lack of a strategy-by-presentation-method interaction that was evident among the "less sophisticated" high school students in the study by Levin et al. (1979, Experiment 3) must be reconsidered in light of the present double replication with "more sophisticated" college students. As was mentioned earlier, other differences in subjects and procedures

distinguish the generally unsuccessful keyword-method implementations of Hall et al. from previously successful ones. The most notable difference in procedures between Hall et al. and those of the present Experiment 1--especially in light of the data and discussion provided by Levin et al. (1979)--was that the Hall et al. subjects were treated in groups. In Experiment 2, we will present additional evidence showing that keyword instructions that produce learning gains under individual administrations may not be effective when those same instructions are group administered.

Experiments 2a and 2b

In a series of experiments, Levin et al. (1979) found that it is not a straightforward matter to obtain positive keyword effects when the method is administered to adolescent subjects in groups. Yet, in each of the Hall et al. (1981) experiments, a group-administration procedure was adopted. For Hall et al. to attribute their nonsignificant results exclusively to their presentation method choice (i.e., subject pacing), rather than to their treatment administration choice (i.e., group administration) would appear to be unwarranted. We now re-examine this matter with subjects selected from a high-school population. Subjects of this age have been found to benefit from the keyword method when treatments are administered on an individual basis (e.g., Levin et al., 1979, Experiment 3).

Subjects and Design

The subjects were ninth- and tenth-grade students selected from two high schools in a university community in the midwestern

United States. The two schools differed from one another principally in terms of their average academic achievement, with the school in Experiment 2a (N=254) being associated with somewhat higher achievement scores than the school in Experiment 2b (N=206).

The basic design and procedures were the same in each experiment. The design paralleled that used in Experiment 1a, namely a familiarization period followed by either a paced or unpaced version of either keyword or no-strategy control instructions. Thus, the design was once again a 2 (instructional strategy) by 2 (presentation method) factorial, but in this case with small groups of subjects assigned to each of the four cells (resulting in 10 groups per cell in each experiment.)[3]

Materials and Procedure

The items to be learned were 30 low-frequency English nouns that had been used in previous keyword research (e.g., McGivern & Levin, in press; Pressley, Levin, & Miller, 1981). All words had concrete meanings and keywords associated with a salient portion of the word.

All treatments were administered to small groups of between 4 and 10 students in different rooms within the school buildings. Several experimenters administered the treatments under appropriate counterbalancing. In each small group, the experimenter explained the task and strategy aloud with the help of three examples (tarn, meaning lake; piggin, meaning bucket; and corsair, meaning pirate). In the keyword conditions, the

experimenter showed the subjects an 8 1/2" x 11" (21.6 x 27.9 cm) interactive illustration of the keyword meaning referents. In the control conditions, subjects were given motivating instructions to use their own "best method" for learning the meanings of the to-be-presented items. The same three sample items were presented for practice. This phase of the experiment took about four minutes in each condition.

In the paced keyword condition, subjects were then familiarized with the to-be-learned vocabulary items and their keywords for four seconds per item (a total of two minutes). The experimenter read each item aloud while the subjects moved a 5" x 8" (12.7 x 20.3 cm) index card down a typed list of the 30 items.[4] Then, keyword subjects were given a total of six minutes to study the vocabulary items, keywords, and meanings which were typed in a different random order on another sheet of paper. The experimenter read each item, its keyword and, its meaning aloud at a rate of one item every 12 seconds as students followed down the list with their index cards.

In the paced control condition, subjects studied two lists of the 30 vocabulary words and their meanings, presented in the same orders as in the paced keyword condition. The experimenter paced the subjects through the first study list by reading the items and their meanings at a rate of one item every four seconds (familiarization), and then through the second study list at a rate of one item every 12 seconds. As in the paced keyword condition, subjects followed the experimenter's pacing by moving an index card down the lists.

In the two unpaced conditions, subjects were allowed the same amount of study time per list as in the paced conditions, but they studied independently. Keyword subjects were given the same two lists that their paced counterparts received, as were control subjects.

After completion of the study phase, subjects in all four conditions turned to the test lists in their booklets. The 30 items were presented in a new random order. Subjects were given five minutes to write down the meanings of as many of the vocabulary words as they could remember.

Finally, in Experiment 2b, following the vocabulary test subjects were asked to complete a short questionnaire modeled after the one used in Experiment 1. That is, subjects were queried on their use of the keyword method while learning the items.

Results

The data from 12 subjects were discarded for various reasons (e.g., non-English speaking, discipline problems), yielding a total of 246 subjects for Experiment 2a and 202 for Experiment 2b. The data from the 10 groups in each of the 4 cells are summarized for each experiment in Table 1. The mean square errors, each based on 36 degrees of freedom, are 119.54 and 116.36 for Experiments 2a and 2b, respectively.

A 2 x 2 analysis of variance was conducted on subjects' mean recall, using the small groups as the units of analysis (see Levin et al., 1979, Experiments 4-6). A significant F-ratio

was obtained only for the strategy main effect in Experiment 2b, with the recall of keyword subjects (43.7%) being reliably lower than that of control subjects (55.4%), $F(1,36) = 11.84$, $p < .01$. All other effects had associated ps $> .10$.

Among the control subjects of Experiment 2b, fully 79% reported having attempted a keyword-like strategy for at least one of the 30 list items. The mean percent of items attempted by keyword-using control subjects was 44%. Because the small groups comprised the units of analysis in the experiment, the following procedure was employed to examine the correlation between subjects' reported number of keyword-elaborated items and their recall: 1. Correlations were computed within each of the 20 control groups, which were then averaged (based on the Fisher transformation). 2. The statistical significance of the 20 transformed correlations was tested for using the t approximation to a one-sample permutation test (see Levin & Peterson, Note 1). Seventeen out of 20 control group correlations were positive, yielding an average correlation of .63 and $t(19) = 4.61$, $p < .001$.

In the keyword condition, 94% of the subjects reported having used the method for at least one item in the list. The average percentage of items elaborated by keyword-using subjects was 72%. As with the control subjects' correlations between reported strategy usage and recall, 17 out of 20 were positive. The average correlation was .52, and according to the test of significance employed, $t(19) = 3.63$, $p < .01$.

General Discussion

Hall et al. (1981) claim that positive keyword-method effects occur with sophisticated learners when vocabulary items are presented in a paced fashion, but not when subjects are allowed to apportion their study time however they wish. That claim no longer seems tenable given the data reported here. In the two experiments in which subjects were treated individually, the keyword method facilitated performance regardless of the method of item presentation used. In the two experiments in which subjects were treated in groups, the keyword method did not facilitate performance, regardless of the method of item presentation used. Thus, based on these results and those from our previous research (Levin et al., 1979), it is strongly suggested that the method-of-treatment administration issue (individual vs. group), and not the method-of-item presentation issue (paced vs. unpaced), is the reason for the failure of Hall et al. to obtain positive keyword effects. The mechanisms mediating the group-administration effect, though currently not well understood, are continuing to receive attention in our laboratories.

Hall et al. (1981) further argue that the method-of-presentation issue is especially relevant when the learners are cognitively sophisticated. That is, the presentation method adopted should moderate keyword effects much more with spontaneously strategic subjects than with less strategic subjects. In both the Hall et al.

study and our experiments, a substantial percentage of control subjects reported spontaneously employing a mnemonic strategy when studying the vocabulary items. (Note, in particular, that in our present group-administered Experiment 2b the figure was nearly 80%, which is quite comparable to the highest percentages reported in mnemonic studies to date--see Pressley, 1982.) Moreover, in all of our experiments, those subjects who reported having elaborated more items also remembered more items. This, to be sure, should be taken by Hall et al. as evidence of "sophistication" in the present subjects. Yet, the method-of-presentation factor played no moderating role among our sophisticated learners.

However, none of our preceding statements should suggest that decisions regarding method of item presentation are inconsequential. Quite to the contrary, in both the present experiments and previous ones (Hall et al., 1981, Experiment 4; Levin et al., 1979, Experiment 3) a higher level of recall was always associated with the unpaced method of presentation. In about half the cases, the effect was statistically reliable. Thus, if maximizing students' overall level of recall is the goal of the researcher, then (s)he should undoubtedly choose an unpaced rather than a paced method of item presentation.

On the other hand, if one wishes to conduct research in which treatment effects are not confounded with differential item exposure and processing, then a paced method of presentation is clearly indicated. That is, the interpretation of both overall and item-based analyses is clouded when equal study of all items

within the list is not guaranteed. That item-based analyses can be particularly informative has been demonstrated in previous studies (e.g., Pressley, Levin, Kuiper, Bryant, & Michener, in press), as well as in the present one. Specifically, our confidence in the keyword method's efficacy is bolstered by the consistently high correlations between subjects' reported use of the keyword strategy and recall, in both keyword and control conditions. Also, that the probabilities of recall of particular items are very closely associated with reported strategy usage provides strong support for the effectiveness of the keyword method in a vocabulary-learning context. Given the potential value of such analyses, the common decision of previous researchers to pace their item presentations is certainly defensible (see the many relevant studies reviewed by Pressley et al., 1982).

Finally, the failure of Hall et al. (1981) to uncover positive keyword effects with late adolescents treated in groups are completely compatible with the results of the group-administered studies reported both here and elsewhere (Levin et al., 1979). Thus, we have no quarrel with most of the Hall et al. results, with the exception of the apparently nonreplicable treatment-by-pacing interaction of their Experiment 4. We hope that the results reported here will lay to rest the spectre raised by Hall et al. concerning treatment-by-pacing interactions in keyword studies. Perhaps investigators who would have devoted their energies to addressing the pacing-interaction "limitation" might more profitably redirect their efforts to finding a solution

to the group-administration difficulties that are apparent in the findings of Levin et al. (1979), Hall et al. (1981), and Experiments 2a and 2b reported here.

Reference Note

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Footnotes

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[1]A secondary reason for using the Hall et al. (1981) Experiment 2 materials was that many of the items in their Experiments 1 and 3 possessed English cognates which "gave away" the meanings of the Spanish words or, at least, should have made the meanings easy to acquire.

[2]The list contained the words balde and manta, which were each defined as bucket by Hall et al. (1981). We assume that the inclusion of two items with the same meaning was an oversight by those authors, but we included them in order to maintain complete list comparability with their Experiment 2 materials.

[3]In Experiment 2a, some classrooms in the study were tested under the paced method, and some under the unpaced method. Subjects were randomly assigned to keyword and control groups within each classroom, but classrooms were not randomly assigned to methods of presentation. Thus, random assignment to strategies but not to presentation methods clouds a "pure" interpretation of the presentation method main effect in Experiment 2a. In Experiment 2b, subjects within classrooms were randomly assigned to all four cells of the design.

[4]The index card was used to focus students' attention on the particular item being read by the experimenter but, of course, this could not be guaranteed.

Table 1

Mean Percent of Meanings Recalled, by Condition and Experiment

	Presentation Method and Strategy			
Experiment	Paced Keyword	Paced Control	Unpaced Keyword	Unpaced Control
1a	57.9	43.8	75.0	48.8
1b	55.4	35.4	76.2	60.4
2a	51.9	59.7	60.6	62.5
2b	41.3	54.4	46.0	56.4